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these Chelonians to move slightly this portion of their bony apparatus." The celebrated authors above mentioned describe but two species of Staurotypus, viz., triporcatus and odoratus. Of the former we have a specimen from the river Medelin, in Mexico, the carapax of which, measures 11 inches (Fr.) in length and 7 in breadth, being much larger than the specimen in the Jardin des Plantes. The sternum is cruciform and has but 7 plates, there being eleven in odoratus. but when we consider that these animals correspond in the shape of the head, the general configuration of the shell, and the *form of the sternum*, these differences may be considered specific, and not generic. The following are the characters of Staurotypus, Cinosternon and Sternothærus, as given by Dumeril and Bibron, (Tome 11, pp. 354, 361 and 396.)

Sub-Fam. CRYPTODERIDÆ.

Gen. STAUROTYPUS, Wagler.

Head subquadrangular, pyramidal, covered in front by a single, very thin plate; jaws more or less hooked; barbels under the chin; 23 marginal scutes; sternum thick, *cruciform*, moveable in *front*, provided with eight or eleven scuta; the axillary and inguinal plates contiguous, placed upon the sterno-costal sutures; anterior feet with five nails, posterior with four only. Two species.

CINOSTERNON, Wagler.

Head subquadrangular, pyramidal; a single rhomboidal plate upon the cranium; jaws slightly hooked; barbels under the chin; scales of the shell slightly imbricated; 23 marginal scutes; sternum *oval*, moveable *in front and posteriorly* upon a fixed piece, provided with eleven scales, with short, narrow, subhorizontal wings; a very large axillary, an inguinal still larger; tail long, (in the males,) unguiculated. (Staurotypus with a larger sternum, and the posterior part of the sternum movable.) Three species.

Sub-Fam. PLEURODERIDÆ.

Gen. STERNOTHÆRUS, Bell.

Head depressed, provided with plates; jaws not denticulated; *no nuchal plate;* sternum large, with very narrow lateral prolongations; *anterior portion* of the plastron rounded, *moveable;* five nails to each extremity. (Three species, all from *Madagascar*. We have three shells of this genus from W. Africa.)

On leave granted, Dr. Le Conte offered the following, which was unanimously adopted:

Resolved, That a special vote of thanks be presented by the Academy to Dr. E. K. Kane, U. S. Navy, for his numerous and valuable donations to the Museum of the Academy.

June 24th.

Vice President BRIDGES in the Chair.

The Committee on Messrs. Berkeley and Curtis' paper, read 10th inst. reported in favor of publication in the Journal.

The Committees on Mr. Sager's paper, read May 13th; on Mr. Lea's paper, read June 3d; on Messrs. Meek & Hayden's paper, read 10th inst.; on Prof. Harper's paper, read 17th inst.; and on Mr. Taylor's and Dr. Hallowell's papers, read same date, severally reported in favor of publication in the Proceedings.

Descriptions of three Myriapoda.

By AB. SAGER.

CRASPEDOSOMADÆ, Gray.

Gen. REASIA? Gr.

Sp. R. SPINOSA, Nob. Body consists of sixty or sixty-one segments, exclusive of the head and ultimate bivalve scale. Segments all marked with sharp longitudinal ridges, the size of which vary considerably. On each side and between the mesial line and stigmata, are seven nearly equal ridges, that border the mesial line somewhat lower than the rest. On the sides are three larger ones terminated with spines, between which there are two smaller and spineless ones; the superior spinous ridge is semi-double and connected with the stigmata; below these are nine or ten smaller ridges, gradually diminishing as they approach the basis of the feet; anterior and posterior segments about equal to the adjoining ones, head glabrous; eyes a black triangular patch at the outer base of the antennæ; body cylindrical, chesnut brown, with a paler dorsal line covering the two dorsal ridges, and a pale lateral line covering the series of the stigmata; feet and antennæ rufous. Differs from the Reasia of Gray in eyes, in a triangular instead of a linear spot, and from the Cylindrosoma of the same author in the distinctness of the ridges and not having a reniform eye spot.

Nearly allied to the Julus lactarius of Say.

Gen. STENONIA, Gr.

Sp. S. HISPIDA, Nob. Body composed of seventeen double segments, distincly divided on the dorsal mesial line. Body depressed, margins of segments quite prominent and curved forwards near the head, in the middle and posteriorly transverse or curved slightly backwards. Surface of each segment covered with five rows of distinct tubercles, arranged somewhat in quincuncial order. From the direction of the tubercles the lateral and posterior margins of each segment appear serrated. First cervical segment smaller than the next, rounded anteriorly, straight and narrower behind, and obliquely truncated on the sides. The posterior segment about equal to the next in length, is triangular, the apex armed with a stiff hair. Color pale red above, feet and ventral surface flesh colored.

Length 6‴. Under decayed logs.

Gen. STRIGAMIA, Gr.

Sp. S. FULVA, Nob. Body somewhat depressed, slightly narrowed towards the extremities, smooth above, rough and villous on the sides and beneath; feet hairy; posterior pair equal in length and twice as large as the next; antennal segments obconical, except the last, which is elliptical, and as long as the two preceding ones. Alternate dorsal scutæ form a slight, obtuse, lateral process. Color fulvous above, fawn colored on the sides and beneath.

Approximates closely to the Geophilus rubens of Say.

Description of Thirteen New Species of Exotic PERISTOMATA.

By ISAAC LEA.

PALUDINA HAINESIANA. Testâ ventricoso-conoideâ, subglobosâ, ponderosâ, solidâ, viridi-palida, arctissimè umbilicatâ, lævi; spirâ obtusâ, ad apicem carneâ; suturis valdè impressis; anfractibus senis, convexis, ultimo amplo; aperturâ magnâ, subrotundatâ, intus albidâ; columellâ albâ, crassâ, incurvatâ.

Hab. Siam. S. R. House, M.D.

PALUDINA UMBILICATA. Testâ carinatâ, obtusè conoideâ, viridi-bruneâ, subtenui, umbilicatâ, lævi; spirâ obtusâ, babylonicâ; suturis linearibus; anfractibus senis, carinatis, supernè planulatis; aperturâ subrotundatâ, intus albidâ; umbilico spiraliter carinato; columellâ incurvatâ.

Hab. Takrong River, Siam. W. A. Haines.

Paludina chinensis. Testâ carinatâ, pyramidatâ, rufo-castaneâ, subcrassâ, arctissimè umbilicatâ, striatâ ; spirâ elevatâ ; suturis impressis ; anfractibus septenis, planulatis, in medio carinatis, supernè geniculatâ ; aperturâ subrotundâ, incurvatâ ; labro angulato.
Hab. China. W. A. Haines.

Paludina Swainsoniana. Testâ globosâ, subsolidâ, tenebroso-viridi, arctissimè umbilicatâ, lævi ; spirâ obtusâ ; suturis valdè impressis ; anfractibus instar quinis, convexis ; aperturâ rotundatâ, intus albidâ.
Hab. Siam. T. R. Ingalls, M.D.

Paludina Ingallsiana. Testâ carinatâ, obtusè conoideâ, tenebroso-viridi, tenui, umbilicatâ, nitidâ ; spirâ obtusâ ; suturis linearibus, anfractibus senis, subplanulatis, minutissimè et transversè striatis ; aperturâ rotundato-ellipticâ, infernè subangulatâ, intus cœruleo-albâ.
Hab. Siam. T. R. Ingalls, M.D.

Bithinia Siamensis. Testâ ovato-concoideâ, palido-olivaceâ, tenui, diaphanâ, nitidâ, lævi, arctissimè umbilicatâ ; spirâ subelevatâ ; suturis linearibus ; anfractibus instar senis, convexis ; aperturâ ovato-rotundatâ, incrassatâ, supernè angulatâ, intus albidâ.
Operculo calcareo, extrinsecùs striis concentricis, intus granulato.
Hab. Takrong River, Siam. S. R. House, M.D.

Bithinia globula. Testâ globosâ, palido-olivaceâ, tenui, diaphanâ, lævi ; imperforatâ ; spirâ depressâ, ad apicè obtusâ ; suturis impressis ; anfractibus quaternis, ventricosis ; aperturâ rotundatâ, incrassatâ, subreflexâ, supernè angulatâ, intus albidâ ; columellâ incrassatâ.
Operculo calcareo lævi, marginatâ.
Hab. India. W. A. Haines.

Paludomus maculata. Testâ ovato-conicâ, virido-luteâ, brunneo-maculatâ, crassâ, imperforatâ, lævi ; suturis valdè impressis ; anfractibus instar quinis, convexis ; aperturâ subrotundâ, intus albâ ; columellâ per albâ, callosâ.
Hab. Ahmednugger, India. S. Shurtleff, M.D.

Ampullaria aurostoma. Testâ subglobosâ, luteâ, transversim vittatâ, crassâ, arcte perforatâ, lævi ; spirâ obtusâ ; suturis vix profundis ; anfractibus instar senis, convexis ; aperturâ rotundo-ellipticâ, subreflexâ, intus aurantiâ et obsolete vittatâ ; umbilico arctè compresso ; columellâ crassâ.
Operculo corneo, pellucido, subtriangulari.
Hab. Carthagena. Col. Totten, J. C. Troutwine, Esq.

Ampullaria tubæformis. Testâ elongato-globosâ, tenebroso-fuscâ, transversim vittatâ, tenui, pellucidâ, latè umbilicatâ, lævi ; spirâ emersâ ; suturis valdè profundis ; anfractibus instar quinis, valdè convexis ; aperturâ magnâ, subrotundâ, dilatatâ, luteo-albidâ, intus brunneo-vittatâ ; umbilico magno ; columella subcallosâ.
Hab. ———? M. Burrough, M.D.

Ampullaria gracilis. Testâ regulariter ellipticâ, luteo-olivaceâ, transversim pervittatâ, subtenui, arctè umbilicata, lævi, nitidâ ; spirâ emersâ ; suturis paulisper impressis ; anfractibus instar senis, subconvexis ; aperturâ ovatâ, intus tenebroso-brunneâ et obsoletè vittatâ ; labio acuto ; umbilico actè compresso ; columellâ lævi.
Hab. Siam. S. R. House, M.D.

Ampullaria turbinis. Testâ turbinatâ, luteo-viridi, transversim vittatâ, subcrassâ, imperforatâ, lævi ; spirâ valdè depressâ ; suturis paulisper impressis ; anfractibus instar quinis, valdè convexis ; aperturâ pergrandi, elongato-ovatâ, vel albâ vel luteâ, intus vittatâ ; labio acuto ; columellâ valdè incurvatâ, incrassatâ.
Hab. Siam. S. R. House, M.D.

Assiminea carinata. Testâ regulariter conicâ, luteâ, vittatâ, subcrassâ umbilicatâ, lævi; spirâ ad apicem acutâ; suturis paulisper impressis, infrâ lineatis; anfractibus instar septenis, planulatis; aperturâ ellipticâ, subcanaliculatâ, intus vittatâ; umbilico spiraliter carinato; columellâ incurvatâ ad basim subangulatâ.
Hab. Siam. S. R. House, M.D.

Descriptions of New Species of Acephala and Gasteropoda, from the Tertiary formations of Nebraska Territory, with some general remarks on the Geology of the country about the sources of the Missouri River.

By F. B. Meek and F. V. Hayden, M. D.

That portion of the great Tertiary basin from which the fossils described in the following paper were obtained, occupies an extensive area of country near the head waters of the Missouri, chiefly between the 46th and 49th parallels of north latitude, and the 100th, and 108th degree of longitude west from Greenwich. According to the Barometrical measurements made by the party charged with the exploration of the proposed northern route of the Pacific railroad, this district varies in its elevation from 1800 to 2700 feet above the present flow of the tidal wave.*

In regard to the geographical, topographical, and physical features of this country, its native tribes, its botany, zoology, &c., much interesting information was long since laid before the public by the reports of Lewis and Clark's and Long's expeditions, by Mr. Catlin, the Prince of New Wied, Mr. Nuttall and others. More recently, much information of a similar nature has been added by the report of the Pacific Railroad Survey. All these enterprising travellers mention the occurrence of sandstones, clays, lignite, &c., but without giving us much information in regard to the age of these formations, the extent of country occupied by them, or as to the character of their organic remains.

In 1849 Dr. John Evans traced a great Lignite formation from below Fort Clark, along the Missouri to a point twenty miles below the mouth of the Yellow Stone; and in 1850 Mr. Thaddeus A. Culbertson, who visited this country under the patronage of the Smithsonian Institution, saw this formation at two or three points above Fort Union. In a map accompanying a highly interesting memoir on the geology of the Hudson's Bay Territories, published recently by Mr. A. K. Isbister, in the Journal of the Geological Society of London, a large area about the sources of the Missouri, is colored as Tertiary, but so as to convey an incorrect idea of the extent of country occupied by it. About the same time, Mr. Jules Marcou published in the Bulletin of the Geological Society of France, a memoir on the Geology of the United States and the British Provinces, accompanied by a map, on which he colors nearly all the country about the head waters of the Missouri as New Red Sandstone, surmounted along the west shore of that stream by Cretaceous outliers. Between this and the Black Hills he brings up to Cannon-ball River, from the White River basin, a continuous belt of Tertiary. West of this he places a belt of Jurassic, and along the supposed position of the Black Hills he runs a stripe of Eruptive and Metamorphic rocks, flanked on the east and west by Carboniferous formations. On the west side of the Black Hills he colors another extensive district of Jurassic. In all this Mr. Marcou is certainly mistaken, excepting in regard to the Eruptive and Metamorphic rocks of the Black Hills; there may also be Carboniferous formations there, but they have not yet been recognized as far north by two or three hundred miles, as laid down by him.

Leaving for a future occasion all local and other details, we now propose to give a brief general sketch of the extent and boundaries, as far as we can, of that portion of the great Tertiary lignite formation from which our fossils were collected, with a few remarks upon its probable age, and relations to the White river basin, as well as to the Cretaceous formations upon which it reposes.

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* Some points not crossed by these explorers may be a few hundred feet higher.

Ascending the Missouri from Fort Pierre, we find on reaching a point five miles below Heart river, about the 47th parallel north, that the Cretaceous formations which are so conspicuous for many hundred miles along the river below, pass by a gentle north or north-west dip beneath the water level, to be succeeded on both sides of the river by Tertiary. Although this is the first point where the Tertiary beds come down to the water level, they are known to occupy the higher country back from the river, on the west side, as far south as the vicinity of *Sawacanna* or Moreau river, and still further west they go as far south as some of the north-west branches of the Cheyenne. Cannon-ball river, Watahoo, and other small tributaries, however, cut down to the Cretaceous beds some little distance back from the Missouri. On the east side of the Missouri the Tertiary is bounded on the south, nearly opposite the mouth of Cannon-ball river, by a range of upper Cretaceous hills bearing off to the north east. South of the Moreau, a similar range, known as Fox Hills, extends from near the Missouri to about the 102° of west longitude, where it is interrupted by a small tributary of the Cheyenne. West of this small stream, the same range of upper Cretaceous hills, known perhaps by other local names, bears round to the north-west, crossing the head branches of the Little Missouri so as to strike the Yellow Stone river about ten miles below the mouth of Powder river; forming nearly all this distance the south and south-west boundaries of that portion of the great Tertiary basin lying in the immense bend formed by the Missouri and Yellow Stone rivers. To comprehend how this range of hills could traverse the country in this way, it must be borne in mind that the Black Hills are laid down on most of the published maps of this country as extending a long distance too far north.

Returning to the point near Heart river, from which we first set out, we find on ascending the Missouri, that the Cretaceous strata again rise to view at a few points not far below Fort Clark, but even here the country on each side is composed of Tertiary. It was at one of these localities the Prince of New Wied collected a nearly entire skeleton of *Mosasaurus Maximiliani* (Goldf.) From the vicinity of Fort Clark we know of no other place where the Cretaceous beds make their appearance until about twelve miles below the mouth of Milk river, (lat. 47° N. long. 104° W.) the country on both sides of the Missouri all this great distance being made up of Tertiary formations, the northern and eastern limits of which are unknown to us. Immediately along the margins of Milk river, Cretaceous beds are seen on both sides as far up as we have any knowledge of the country, though the higher country back from the river is Tertiary. From the point below the mouth of this stream on the Missouri, where the Cretaceous beds first make their appearance, they are seen to rise higher and higher as we ascend the Missouri, in consequence of their inclination to the east or north-east. On the north side of the Missouri, between it and Milk river, the higher portions of the country back from the Missouri, are also composed of Tertiary beds.

The same formations likewise occupy nearly all the country between the Missouri and Yellow Stone, as far west as the vicinity of Muscleshell river, where they thin out on the summits of Cretaceous hills. The hills, however, near the Missouri, between Milk and Muscleshell rivers, are also mainly Cretaceous, the Tertiary being for the most part worn away by atmospheric agencies.

On both sides of the Yellow Stone, only Tertiary strata are seen from near the mouth of Powder river as far up as the mouth of the Big Horn. How far beyond this they extend we do not know, though we have received Tertiary fossils from intelligent traders, collected as far up the Big Horn as one of its tributaries known as Little Horn river. From another point as far west on the Yellow Stone as Rose river, we received a few Cretaceous fossils. As to the limits of the Tertiary up Powder and Tongue rivers, we have no definite information. The traders say the same kind of lignite beds seen along the Yellow Stone, occur along the banks of the former as much as one hundred and fifty miles above its mouth.

The foregoing hasty sketch is given more with a view of showing the extent of country occupied by this great Tertiary lignite formation, than with any hope of conveying a definite idea of its precise limits. If it should prove to be only a part of the same extensive fresh water lignite formation observed by Sir John Richardson on the Saskatchawan, of which we have little doubt, then it is highly probable the Lignite and Coal formations mentioned by Mr. Isbister as flanking the eastern slope of the Rocky Mountains, in the form of a continuous belt from the Saskatchawan to the Arctic Ocean, belong to the same epoch.

For the most part, these deposits in Nebraska consist of beds of gray, yellowish, whitish, and blue sand, sandstone, clay, &c., with alternating strata of lignite of variable purity, and carbonaceous matter mingled with much sand and clay. These beds of lignite often take fire spontaneously, from heat generated in the decomposition of iron pyrites, and burn for many years at a time, sending forth suffocating sulphurous vapors, and causing such an intense degree of heat as to fuse the contiguous clay and sand into masses presenting every degree of compactness, from that of obsidian to light vesicular lava. In some of the argillaceous beds, great numbers of beautiful fossil plants are found, a fine series of which was collected and placed for investigation in the hands of Dr. J. S. Newberry, the well known fossil botanist of Cleveland, Ohio. The remains of Mollusca collected from these formations, over a wide extent of country, present a remarkable uniformity of character, and as may be seen by the following paper, are all, excepting a few land shells, referable to genera usually found in fresh and brackish waters. It is an interesting fact that the most nearly allied living representatives of many of these species are now found inhabiting the streams of Southern Africa, Asia, China, and Siam, apparently indicating the existence of a tropical climate in these latitudes at as late a period as the Tertiary epoch.*

Although there can be no doubt that these deposits hold a rather low position in the Tertiary System, we have as yet been able to arrive at no very definite conclusions as to their exact synchronism with any particular minor subdivision of Tertiary, not having been able to identify any of the Mollusca found in them with those of any well marked geological horizon in other countries. Their general resemblance to the fossils of the Woolwich and Reading series of English geologists, as well as to those of the great Lignite formations of the south-east of France, would seem to point to the lower Eocene as their position. Yet it may be possible these resemblances have resulted from the action of precisely similar causes at a somewhat later period.

It is a little remarkable that these formations differ in many respects from those of the White river basin lying so near on the south. In the first place they generally contain more sand, are usually characterized by beds of lignite, and as yet have furnished no remains of Mammalia; while the White river basin is more argillaceous, appears to be destitute of lignite, and is well known to be one of the most remarkable repositories of extinct mammalian remains on the face of the globe. In addition to this, not one of the species of Mollusca in our collection from the Lignite formations, is identical with any of those described by Dr. Evans and Dr. Shumard from the White river basin.

Formations immediately beneath the Tertiary in this district.

It would seem that the change of physical conditions which closed the Cretaceous epoch and ushered in the Tertiary, in this part of the world at least, was gradual,—not violent. We find that even while the Cretaceous conditions still existed, (during the deposition of No. 5 of the series†) the approaching close of that state of things, and the coming of the Tertiary era, were foreshadowed by the introduction of *Fasciolaria*, *Pleurotoma*, and *Belemnitella*, with many shells of other genera, quite as near in their specific affinities to Tertiary as to Cretaceous forms; while the sea was gradually becoming more shallow, as is shown by the increase of *gasteropoda*. We even know from the presence of a few remains of *lycopodiaceous* plants, and an occasional unbroken leaf of some *exogenous* tree, that there was dry land at this time somewhere not very far away. Gradually, as we ascend in the series, the strictly marine animals disappear, and we meet with *Ostrea*, *Corbula*, and *Cerithium*, mingled in the same bed with *Melania*, *Paludina*, *Physa*, *Cyrena*, &c., ALL of Tertiary types; while a little higher in the series, we find at some places only the remains of land and fresh water mollusca.

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* We are under many obligations to Dr. Isaac Lea, of Philadelphia, for the privilege of comparing our fossil species with analogous forms in his magnificent collection of recent shells.

† For a section of the rocks of this country see a paper by James Hall and F. B. Meek in the Memoirs. Am. Acad. Arts and Sci. vol. 5, New Series. Likewise a paper by F. B. Meek and F. V. Hayden in Proceed. Acad. Nat. Sci. Phila., March 1856.

From the above facts, especially the presence of *Pleurotoma*, *Fasciolaria*, and *Belemnitella*, in this upper member of the Cretaceous system of this country, we cannot think it represents any part of the Green Sand of English geologists. Numerous well marked Cretaceous forms show it cannot be Tertiary, consequently we think it must represent some portion of the true Chalk. We are by no means inclined, however, to adopt the views of M. Alcide D'Orbigny, who regards all the Cretaceous formations of the United States and Western Territories as referable to a later epoch than the Green Sand, as the next succeeding formation below that of which we have just been speaking, (No. 4 of the series), is characterized by numerous fossils of unquestionable Green Sand type. We think confusion has been created in tracing out the parallelism between American and European Cretaceous formations, by fossils from different positions in this country having been mingled together and described as if they occurred in the same bed.

Formations at the base of the Cretaceous Series of this district.

As previously stated, near the mouth of Milk river, Cretaceous strata which are not seen for a long distance below this on the Missouri, again rise to view. They consist of the upper two members of the series (No. 5 and No. 4) which, in consequence of their inclination to the east, are found to rise higher and higher as we ascend the river, so that nearly all the hills close to the Missouri, between Milk and Muscleshell rivers, consist of these formations. Some four or five miles below the mouth of Muscleshell river, a lower rock,—a sandstone,—rises above the water level. This is probably No. 1 of the series, No 2 and No. 3 not being represented here. It is worthy of note that out of two species of *Mactra*, two of *Tellina*, two of *Inoceramus*, one of *Pholodomya*, two of *Natica*, and one *Baculite*, found in this rock, not one is known to occur in any of the higher formations, and some of these species are not unlike *Neocomien* forms.

In consequence of the increasing inclination of the strata, this last mentioned sandstone rises in the vicinity of North Mountain river as much as 250 feet above the Missouri. Here, or near this, begins a wild and desolate region, known as the *Mauvaises Terres* or Bad Lands of the Judith. At various places in these Bad Lands a sandstone similar to No. 1 was seen alternating with beds of clay and lignite, all of which are upheaved and much distorted. It was found impossible to devote to the examination of these formations time enough to determine their relations to the Cretaceous and Tertiary strata of this region, without running the risk of being cut off from the party and murdered by the Indians. Amongst a few fossils that were collected here, however, Prof. Leidy finds teeth which he refers to two or three genera of large *Saurians* allied to the *Iguanodon*, *Megalosaurus*, &c. There are also in the collection from some of these beds, one or two species of *Unio*, one or more of *Cyclas* or *Cyrena*, and a few crushed specimens of *Gasteropoda* like *Paludina* and *Melania*. From these facts, we are strongly inclined to think with Prof. Leidy, there may be here, at the base of the Cretaceous System, a fresh water formation like the Wealden. In as much, however, as there certainly are some outliers of fresh water Tertiary in these Bad Lands, we would suggest that it is barely possible these remains may belong to that epoch, though the shells appear to be all distinct species from those found in the Tertiary at all the other localities in this region.

We remember seeing in 1853, between the mouth of Big Sioux and Platt rivers on the Missouri, some exposures very similar to those of the Bad Lands of the Judith, excepting that there appeared to be no beds of Lignite. We saw no fossils in these beds, but were at that time impressed with the opinion that they belonged to the lower part of No. 1, which is well exposed a little higher up the river at the mouth of the Big Sioux, but soon dips beneath the water level to be seen no more between there and the far distant point already mentioned, near the mouth of Muscleshell river.*

DESCRIPTIONS OF SPECIES.

Cyclas formosa.

Shell small, oval, oblique, scarcely ventricose; cardinal margin straight buccal end rounded; anal extremity obliquely truncate; basal margin semi-elliptical or broadly rounded; beaks obtuse, tumid, rising somewhat above the hinge, nearly touching, placed a little in advance of the middle; surface ornamented by very fine, regular, distinct, concentric wrinkles. Length .17 inch; breadth .08 inch; height .14 inch.

Locality. Three miles above Fort Union.

Cyclas fragilis.

Shell small, subcircular, slightly oblique, scarcely ventricose, very thin and fragile; extremities and base rounded; posterior end wider than the anterior; beaks moderately elevated, tumid, slightly in advance of the centre; surface apparently marked with fine indistinct lines of growth. Length .24 inch; breadth about .13 inch; height .22 inch.

All our specimens of this species being more or less worn, it is possible the lines of growth may be more distinct on perfect specimens. Sometimes the posterior slope, from a little behind the beaks, appear to have been obliquely subtruncate.

Locality. Same as last.

Cyclas subellipticus.

Shell small, elliptical-ovate, somewhat ventricose, thin and fragile; posterior end narrower than the anterior, both narrowly rounded; base semi-elliptical or semi-ovate; cardinal border apparently rounding gradually to both extremities; beaks not much elevated, pointed, incurved, not oblique, located near the middle; surface indistinctly marked with lines of growth. Length ·24 inch; height ·14 inch.

The beaks are so near the middle, and curved so nearly at right angles to the longitudinal diameter of the shell, that it is not easy to determine, especially from the examination of mutilated specimens, which is the posterior, or which the anterior end. As we have only seen imperfect specimens, we are not sure the surface markings are indistinct on unworn shells.

Locality. Three miles above Fort Union.

Cyrena Moreauensis.

Shell ovate, nearly elliptical, compressed, extremities rounded; anterior end narrower than the posterior, base semi-ovate, most prominent behind the middle; beaks not much elevated, placed a little in advance of the centre; surface marked with fine distinct lines of growth; cardinal edge rather thick, and having under the beaks three diverging central teeth in each valve, the anterior of which is the smallest; lateral teeth two, (in the left valve) long, parallel to the cardinal edge, and fitting into corresponding grooves in the other valve; muscular impressions deep. Length about ·90 inch; breadth ·36 inch; height ·66 inch.

Each of the cardinal teeth has, in its upper end, a small notch which is occupied, when the valves are closed, by a small projection between the teeth of the other valve. The anterior lateral tooth appears to be larger and approaches the central teeth more nearly than the posterior. Our specimens are generally more or less worn, and thickly coated with firmly adhering sand.

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* The foregoing remarks are based upon the observations and collections of Dr. Hayden.

Locality. Near Moreau river, in a sand bed, associated with bones of *Titanotherium?* Probably a distant outlier of the White river bone beds.

CYRENA INTERMEDEA.

Shell oval-ovate, compressed, rather thin; extremities rounded; base semi-elliptical; beaks moderately elevated, not gibbous, placed nearly half way from the middle to the anterior end; surface marked with fine lines of growth, occasionally rising into obscure concentric wrinkles; edge of the cardinal border thin; cardinal teeth close under the beaks, posterior one very oblique. Length ·76 inch; breadth ·22 inch; height ·68 inch.

This species approaches some varieties of *C. pisum*, of Deshay's (Coq. foss. page 117,) but is more inequilateral, the posterior end being comparatively longer, the beaks are also less elevated. From the last it will be distinguished by its shorter and more rounded form, more elevated beaks, and much thinner cardinal edge.

Locality and position. Same as last.

CYRENA OCCIDENTALIS.

Shell sub-triangular, very thick, rather ventricose; anterior end and base rounded, posterior end sloping abruptly from the beaks, and ventrically subtruncate at the extremity; beaks located a little in advance of the middle, and elevated, pointed, incurved, and approximate; surface marked with strong lines of growth. Length 1 inch; breadth ·71 inch; height 1 inch.

Appears to be intermediate between *C. cordata* of Morris (*Proceed. Geol. Society, vol* 10, *pl.* 2, *figs.* 7, 8, 9,) and *C. antiqua* of Ferussac, (*see* Deshays' *Coq. foss.*, *pl.* 18, *figs.* 19, 20, 21) both of which are Eocene species. From the first, it differs in being relatively higher; its posterior end is also shorter, and more distinctly subtruncate. From the latter, it differs in being less elevated, not so concave in front of the beaks, nor so regularly arcuate on the posterior slope from the beaks to the base. In front, it presents the same symmetrical cordate outline common to both these species.

Locality. Bad Lands of the Judith.

CORBULA SUBTRIGONALIS.

Left valve subtrigonal, very convex, obliquely truncate from the beaks to the extremities, the two slopes diverging at an angle of 95°; basal margin rounding up abruptly in front, and converging towards the posterior slope at an angle of about 48°; beaks elevated, located in advance of the middle; surface marked by faint lines of growth, and having below the middle three or four concentric wrinkles, which become stronger towards the extremities. The right valve is much more compressed, and without concentric folds. Length ·74 inch; breadth ·25 inch; height ·55 inch.

The larger, or left valve of this species, has an obscure ridge passing from the beaks obliquely backwards and downwards to the posterior extremity, along which the valve is abruptly deflected towards the hinge margin. This and the following species may have possessed other surface markings not now preserved, the specimens being all considerably worn, as if they had been exposed to the action of waves on a beach.

Locality. Mouth of the Judith, associated with *Ostrea subtrigonalis* (Evans and Shumard), also *Melania*, *Paludina*, and other fresh water shells.

CORBULA PERUNDATA.

Right valve sub-trigonal, rather compressed, obliquely sub-truncate from the beaks toward both extremities, the slopes diverging at an angle of about 82°; basal margin rounding up in front, straight towards the posterior; beaks small, much elevated, and placed a little in advance of the middle; surface ornamented by five or six strong, elevated, concentric folds, otherwise apparently smooth. Length ·32 inch; breadth ·13 inch; height ·27 inch.

The left valve of this species is yet unknown to us.

Locality and position. Same as last.

CORBULA MACTRIFORMIS.

Shell subtriangular, scarcely ventricose; right valve a little larger, thicker and more gibbous than the left; extremities narrowly rounded; posterior end longer than the anterior, slightly truncate at the extremity, and having an obtuse ridge passing from the beaks obliquely backwards to the lower posterior edge; base semi-ovate, most prominent in advance of the middle; beaks considerably elevated, pointed, incurved, and directed forward; surface marked with fine lines of growth. Length ·64 inch; breadth about ·33 inch; height ·50 inch.

The tooth of the right valve is thick, and located immediately under the beaks, while that of the left is flattened, and placed a little behind them. The lateral edges of the cardinal border of the left valve, as well as its basal margin, which are sharp and prominent, fit into a distinct groove in the edge of the opposite valve. The muscular impressions are indistinct, and the sinus of the palleal impression triangular, very broad and shallow.

Locality. Fort Clark, where it is associated with *Melania*, *Paludina*, &c.

UNIO PRISCUS.

Shell ovate, rather compressed, very thin and fragile; anterior extremity short, rounded; posterior end narrower, contracting with a regular curve from above, and having at the extremity below a very obtusely rounded angle; cardinal border broadly arcuate; basal margin nearly straight behind the middle, rounding up in front; beaks very small, rising little above the hinge, located about one-sixth the entire length of the shell behind the front, and ornamented with small regular concentric wrinkles; surface of other portions of the shell smooth, or only marked with fine lines of growth. Length 2·78 inches; breadth unknown; height 1·63 inches.

Has much the aspect externally of an *Anodonta*, but a fragment in our collection shows enough of the hinge to prove it to be a *Unio*, without exhibiting the details of the teeth. Judging from the beaks, young specimens not more than half an inch in length must be beautifully ornamented with regular concentric wrinkles. It is usually found in a crushed condition between the laminæ of clay.

Locality. Yellowstone River, forty miles above the mouth.

BULIMUS? TERES.

Shell small, sinistral, much elongated, terete; volutions ten to ten and a half, narrow, closely wound, and increasing very gradually from the apex, slightly convex near the summit of the spire, but flattened lower down; suture very faintly impressed between the lower volutions, but becoming more distinct towards the apex; surface marked with fine, regular lines of growth, passing straight across the whorls at right angles to the suture; aperture ovate, acutely angular above, rounded below; lip thin. Length ·76 inch; breadth ·19 inch; apical angle slightly convex, divergence 18°.

A few dextral shells were found associated with the above, which, as far as we have been able to see, differ from them in no other respect. It is possible, however, they may belong to a distinct species, though we are now inclined to regard them as merely a variety of the same. This and the following species are evidently closely related to a shell described by M. Matheron, from the Tertiary lignites near the mouth of the Rhone, south-east of France. (See *Melania acicula*, p. 219, pl. 36, fig. 25; *Catalogue Methodique*, &c.) Like some of ours, his is a sinistral shell, and has much the same general appearance, but it is even more elongated; and has nearly twice as many volutions. We doubt very much the propriety of referring such forms to the genus *Melania*, as they appear to us to have much more the aspect of land shells. Unfortunately all our specimens have the aperture more or less broken or distorted, as was the case with those studied by M. Matheron. The spire looks very like *Clausilia*, but the aperture was evidently more like *Bulimus* or *Achatina*. It is not improbable they may form a distinct group, holding an intermediate position between *Clausilia* and *Bulimus*.

Locality. Three miles below Fort Union.

BULIMUS? VERMICULUS.

Shell small, sinistral, greatly elongated, cylindrical; volutions about thirteen, narrow, closely wound, increasing very gradually from the apex, somewhat convex near the summit of the spire, but flattened lower down; suture very faintly impressed between the lower volutions, but becoming more distinct above; surface marked with fine regular lines of growth passing straight across the whorls at right angles to the suture; aperture unknown. Length about ·60 inch; breadth ·13 inch; apical angle slightly convex, divergence 13°.

This is very near the last, and may be only a variety of the same. It differs, however, in being more nearly cylindrical in form; the volutions are more numerous, more closely wound, and do not increase so rapidly from the apex, while the suture is less oblique, especially between the lower volutions.

Locality and position. Same as last.

BULIMUS LIMNEAFORMIS.

Shell narrow ovate, rather thick; spire conical, obtuse at the apex; volutions five to five and a half, convex; suture distinct; surface marked with faint lines of growth; aperture ovate, angular above, rounded below; outer lip apparently a little obtuse, or abruptly bevelled; inner lip very thin on the body whorl above, thicker and slightly reflexed below; columella regularly curved. Length ·42 inch; breadth ·20 inch; length of aperture ·20 inch, breadth of do. ·10 inch; apical angle convex, divergence 38°.

From the same locality and position we have a single specimen agreeing in all respects with the above, excepting that the volutions are much flatter and the suture less distinct. This may be another species, but without seeing more specimens we are unable to satisfy ourselves it is not a variety of the same.

Locality. Fort Clark.

BULIMUS NEBRASCENSIS.

Shell ovate; spire rather short, conical, obtuse at the apex; volutions four and a half, convex; suture distinctly impressed; surface polished and marked with nearly obsolete lines of growth; outer lip apparently sharp; inner lip very thin above, thicker and slightly reflexed below; aperture narrow ovate, acutely angular above, somewhat narrowly rounded below. Length ·27 inch; breadth ·13 inch; length of aperture ·15 inch, breadth of do. ·07 inch; apical angle convex, divergence 47°.

It is possible this may be only a variety of the last, which it resembles in many respects. It differs, however, in being a relatively thinner shell, has one whorl less, the spire is comparatively shorter, and the apical angle is considerably greater.

Locality and position. Same as last.

PUPA HELICOIDES.

Shell very small, oval or ovate; spire moderately elevated, apparently obtuse at the point; volutions five, convex, increasing gradually from the apex; surface marked with strong lines of growth, which cross the whorls obliquely; suture distinctly impressed; aperture very oblique, subcircular, rounded on the lower and outer sides, nearly straight next the body whorl; lip slightly reflexed; umbilicus quite small. Length ·12 inch; breadth ·08 inch; length of aperture ·05 inch, breadth of do. .04 inch.

So far as we have been able to see from examining distorted specimens of this species, it is without teeth. In this, as well as in many other respects, it appears to have been very much like the recent *P. simplex* (Gould,) but is about three times as large, and differs in having stronger and more elevated lines of growth. It may be an elevated *Helix*.

Locality. Three miles above Fort Union.

LIMNÆA TENUICOSTA.

Shell small, turrited, very slender; spire acutely elevated; volutions four to four and a half, vertically flattened, (or slightly convex,) increasing rapidly in the direction of the longitudinal axis of the shell, and each so much smaller than the succeeding one below it, as to form a shoulder or offset at the suture; surface ornamented by sharply elevated, equidistant, linear folds parallel to the minute lines of growth; suture very oblique, rather strongly impressed; aperture unknown. Length ·29 inch; breadth ·08 inch; apical angle regular, divergence about 26°.

This exceedingly slender, delicate little *Limnea*, is not apt to be confounded with any other fossil or recent species with which we are acquainted. Its attenuated form, vertically flattened whorls, and peculiar linear folds, are characters by which it will be easily identified. None of our specimens show the aperture, though it must be narrow, and a little shorter than the spire. It is a very rare shell.

Locality. Three miles below Fort Union.

PHYSA LONGIUSCULA.

Shell elongate ovate; spire slender, rather elevated, acute at the apex; whorls about six, flattened or slightly convex; suture not very distinct; surface marked with fine, straight, nearly obsolete lines of growth, which cross the whorls at right angles to the suture; aperture apparently narrow; outer lip meeting the body whorl at an acute angle above. Length ·59 inch; breadth ·27 inch; apical angle regular, divergence 43°.

Our specimens are too imperfect to show the exact form of the aperture, though it appears to have been narrow, very acutely angular above, and narrowly rounded below. The lines of growth are faint, and the substance of the shell thin. This species quite closely resembles some varieties of *P. hypnorum* (Lin.,) but the body volution is relatively wider, the spire somewhat less elevated, and the aperture narrower.

Locality. Three miles above Fort Union.

PHYSA RHOMBOIDEA.

Shell small, oval, narrowing abruptly from the middle towards both extremities; spire rather short, conical, pointed; volutions four and a half, slightly convex, last one large, but scarcely ventricose; surface marked with fine lines of growth; suture distinct; aperture narrow, acutely angular above, narrowly rounded below; inner lip closely spread upon the body whorl above, and forming a fold below the deeply impressed umbilical region. Length ·26 inch; breadth ·16 inch; length of aperture ·15 inch, breadth of do. ·07 inch; apical angle nearly regular, divergence 57°.

The smaller size, less elongated form and shorter spire, will serve to distinguish this species from the last. From the same bed we have a few other specimens, which have a relatively wider and more oblique aperture, and a more ventricose body whorl, but they are so nearly identical in other respects with this, that we can only regard them as a variety of the same.

Locality and position. Same as last.

PHYSA NEBRASCENSIS.

Shell large, ovate, thin; spire rather short; whorls about five, flattened or slightly convex; suture very oblique, not strongly impressed; surface marked with coarse lines of growth; aperture narrow, acutely angular above, narrowly rounded below; columella impressed in the umbilical region, and having a kind of fold at its junction with the outer lip below. Length about 1 inch; breadth ·57 inch; length of aperture ·55 inch, breadth of do. ·26 inch.

It is probable the above description will have to be modified somewhat, when perfect specimens are obtained, as all those we have seen are more or less broken.

Locality. Three miles below Fort Union.

Physa subelongata.

Shell elongate ovate; spire elevated, acute at the apex; volutions about six and a half, nearly flat; suture oblique, linear, scarcely distinct; surface faintly marked with lines of growth; aperture unknown; columella twisted into a kind of fold below the impressed umbilical region. Length 1·16 inches; breadth ·53 inch; length of aperture about ·57 inch; apical angle very convex, divergence 49°.

This *Physa* belongs to the same type as two or three elongated species described by Matheron, from the Great Lignite formations of the south of France, (*Catalogue Methodique*, &c., pl. 36.) It differs, however, from his *P. Gardanensis*, which it most nearly resembles, in having much flatter volutions, a less distinctly impressed suture, and relatively smaller body whorl. Our specimen is so much broken and worn, that if there were other markings than those preserved they would have been obliterated.

Locality. Bad Lands of the Judith.

Planorbis subumbilicatus.

Shell very small, subdiscoidal; spire flat; volutions two and a half to three, nearly cylindrical; surface marked with very fine, rather indistinct lines of growth; sutures strongly defined; umbilicus large, showing the volutions to the apex; aperture round or obliquely a little oval. Larger diameter ·13 inch; smaller do. ·14 inch.

Locality. Three miles below Fort Union.

Planorbis convolutus.

Shell large, discoidal, nearly equally concave, and exhibiting all the whorls on both sides; volutions slightly embracing, very strongly separated by the sutures, more broadly rounded on the right than on the left side; surface (of cast) having faint undulations parallel to the obsolete lines of growth, which pass round very obliquely forward from the right to the left; aperture ovate, narrower on the left than the right side, slightly concave within, for the reception of the succeeding whorl; right lip projecting considerably beyond the left. Greater diameter 1.01 inch; smaller do. .32 inch.

In its general appearance this species approaches *P. rotundatus* of Brong., but is much less compressed. It differs also in the form of the aperture, which is wider than high, while that of *P. rotundatus* is higher than wide (See Deshays' *Coq. foss.* pl. 9, fig. 7 and 8.)

Locality. Little Horn river.

Velletia (Ancylus) minuta.

Shell minute, ovate or elliptical-pattiform, exceedingly thin and fragile; extremities rounded; anterior end apparently a little wider than the posterior; apex moderately elevated, obtuse, nearer the posterior end than the middle, turned to the left; front slope convex; posterior and postero-sinistral slopes concave, dextral convex; surface marked with fine concentric striæ. Length .08 inch; breadth .06 inch; height .03 inch.

Resembles *Velletia elegans* of Edwards, (*Ancylus elegans* of Sowerby, Min. Conch. pl. 533) but is much smaller, and wants the radiating striæ of that species.

Locality. Three miles below Fort Union.

Paludina multilineata.

Shell conical-ovate, rather thin; spire elevated; volutions six to six and a half, rounded convex, increasing gradually from the apex; suture strongly impressed ; surface ornamented by more or less distinct lines of growth, which are crossed by numerous small, thread-like, revolving lines ; aperture comparatively small, obliquely-ovate ; inner lip thin and reflexed below so as to partly cover the small umbilical perforation. Length 1 inch ; breadth .71 inch ; length of aperture .47 inch ; apical angle convex, divergence 54 to 60°.

Sometimes the lower volution, which generally forms less than half the entire length of the shell, is slightly flattened above the middle, so as to leave an obscure angle a little below the suture. On the upper half of the volutions the revolving lines are separated by spaces from two to five times their width, but decrease in size and become closely crowded on the lower part of the last whorl, excepting near the umbilicus, where they are again stronger, more distant, and minutely flexuous. On worn specimens the revolving lines are often obscure.

Locality. Fort Clark.

PALUDINA VETULA.

Shell conical-ovate, not very thick ; spire relatively small, moderately elevated; volutions about five and a half, convex, narrow, increasing gradually from the apex, last one large and ventricose; surface marked with fine lines of growth, which are crossed by obscure revolving lines ; suture strongly impressed, very slightly oblique; aperture narrow ovate ; umbilical perforation closed or very small. Length about .81 inch ; breadth .60 inch ; length of aperture .40 inch ; breadth of do. .24 inch ; apical angle nearly regular, divergence 60°.

Associated with this species a few specimens about one third larger were found, which have a more elevated spire, in consequence of which the divergence of the apical angle is some four or five degrees less. The revolving lines also appear stronger. It is very difficult to determine, without a larger number of individuals in a better state of preservation, whether they are a variety of this species or whether they may not be identical with the last. It is even possible a more extensive collection may prove both these to be only varieties of the last, though as we now see them, they present quite a different aspect, especially the smaller variety, which has a more slender and much less elevated spire, with more depressed whorls, smaller umbilical perforation, and much less distinct revolving lines. The body whorl is also relatively larger and much more extended below.

Locality. Bad Lands of the Judith.

PALUDINA LEAI.

Shell conical-ovate, oblique ; spire not much elevated, pointed at the apex ; volutions five and a half to six, convex, sometimes ventricose, last one obscurely angular below the middle ; suture well defined ; surface marked with fine lines of growth, which are crossed by extremely fine, nearly obsolete revolving striæ, and at regular intervals by revolving rows of minute, shallow punctæ ; aperture broad ovate, obtusely angular above, rounded below ; outer lip thin ; inner lip thin above, thicker and slightly reflexed below the small umbilical pit ; columella deeply arcuate. Length .97 inch ; breadth .75 inch ; length of aperture .47 inch ; breadth of do. .40 inch ; apical angle convex, divergence 65° to 80°.

This shell varies so greatly in the elevation of its spire, and the divergence of its apical angle, that its varieties might be mistaken for three or four distinct species. We have satisfied ourselves, however, by examining a large number of specimens, that all these varieties are connected by a regular series of intermediate forms. In some individuals the upper volutions are slightly flattened on top immediately below the suture, in others they are rounded convex, while in a few instances all the whorls are more or less depressed, so as to give the shell a subtrochiform aspect. Generally the fine revolving striæ and rows of minute punctæ are nearly obsolete, and they are never visible without the aid of a good lens.

It is an interesting fact that this species is so nearly allied, both in form and surface markings, to a *Paludina* now inhabiting the streams of Southern Asia, (*P. Bengalensis*, of Lea) as to give rise to a doubt whether or not they really are distinct. By comparison, however, with authentic specimens of the latter in the cabinet of Dr. Lea, at Philadelphia, we find his species is generally larger and slightly more elongated than ours, and the body volution more rounded and less extended below.

We name this species after Dr. Isaac Lea, the well known conchologist, who first made known one of its nearest living representatives.

Locality. Fort Union.

PALUDINA RETUSA.

Shell obliquely obovate; spire depressed conical, obtuse at the apex; volutions four and a half to five, convex, last one large, obliquely depressed above, and obscurely angular below; suture well defined; surface marked with distinct oblique lines of growth, and faint traces of extremely fine revolving striæ; aperture (broad ovate?) obtusely angular above, rounded below; pillar lip thin above, thicker and closely folded back upon the deeply arcuate columella below. Length .84 inch; breadth .64 inch; apicial angle very convex, divergence about 90°.

It is barely possible this may be one of the extreme varieties of the last; it differs however from any of the forms we have considered referable to that species, in having a much less elevated and more obtuse spire. The lines of growth also pass round the volutions much more obliquely, and the body volution is relatively larger. None of our specimens have the aperture entire.

Locality. Three miles below Fort Union.

PALUDINA CONRADI.

Shell elongate-trochiform, thick; spire rather elevated, acute at the apex; volutions apparently about six, flat, last one more or less angular below the middle, and obliquely extended below; surface marked with fine lines of growth, crossed by delicate, nearly obsolete, revolving lines; suture linear; aperture subcircular, or broad ovate, obtusely angular above, (broadly rounded below?); columella profoundly depressed in the umbilical region; umbilicus none. Length about 1 inch; breadth ·70 inch; length of aperture ·44 inch; apical angle slightly convex, divergence 54°.

In young specimens the angle on the lower part of the body whorl is quite distinct, and modifies the form of the aperture, but is more obscure in older shells. Like *P. Leai* (of this paper), this species also has its near living representatives amongst Asiatic species, of which *P. Francisci* (Turbo Francisci of Wood,) is an example. We name it in honor of Mr. T. A. Conrad, of Trenton New Jersey.

Locality. Bad Lands of the Judith.

PALUDINA PECULIARIS.

Shell trochiform, rather thin, oblique; spire conical, acute at apex; volutions (five and a half?) flattened convex, last one distinctly angular a little below the middle; surface marked with fine, rather indistinct lines of growth, crossed by nearly obsolete, exceedingly fine revolving striæ; suture moderately defined; aperture round ovate, or sub-quadrate.

Our specimens of this species are imperfect at both extremities; some of them have a breadth of ·53 inch, and indicate a length of about ·70 inch The apical angle of a specimen consisting of the lower two whorls is 47°; but as it was probably greater near the apex, the mean may have been as great as 50°. In form and general appearance it is very much like the last, and may possibly prove to be only a variety of that species; it is, however, a thinner shell, and the volutions are more convex.

Locality. Fort Clark.

PALUDINA TROCHIFORMIS.

Shell trochiform, thin; spire conical, pointed at the apex; volutions five and a half to six, nearly flat, and ornamented by two slightly elevated revolving ridges; last whorl strongly angular below the middle; surface marked with very fine lines of growth, and exceedingly slender, raised, revolving lines; suture linear, scarcely distinct; aperture sub-quadrate, or rounded ovate, more angular above, broadly rounded below; lip thin, reflexed on the columellar side below, but leaving a small umbilical groove; columella strongly arcuate. Length ·86 inch; breadth ·73 inch; apical angle convex, divergence 73° to 77°.

This interesting shell is so unlike the usual forms of *Paludina*, that we would have referred it to that genus with much doubt, had it not been for the fact that we have from the same bed some intermediate gradations between it and the usual typical forms of the genus. One of these, *P. Leidyi* of this paper must be (judging from the upper volutions,) in its young state, almost exactly like this, both in form and surface markings, yet at maturity, its last volution loses almost entirely the angular outline characterizing this species at all stages of its growth. We have seen fragments of this species indicating a size at least three times as great as that of the specimen from which the above measurements were taken.

P. cingulata of Matheron (see *Catalogue Methodique*, &c., p. 223,) from the Lignite formations near the mouth of the Rhone, resembles this more than any fossil species with which we are acquainted, but differs in the surface markings. Amongst recent species it has two or three closely allied representatives, now inhabiting the rivers of China and Siam, of which *P. pyrimidata* (Phillippi) is an example.

Locality. Ten miles below Fort Union.

PALUDINA LEIDYI.

Shell very large, conical-ovate, oblique, thin; spire elevated; upper volutions flattened, and ornamented by two indistinct revolving ridges; lower ones more rounded, last rather ventricose, and obscurely angular below; suture linear and scarcely distinct above, but well defined between the lower whorls; surface marked with distinct lines of growth, crossed by very fine, elevated revolving lines, generally obsolete on the lower volutions; aperture apparently ovate; inner lip spread upon the body whorl, but leaving partly uncovered a small, deep, oblique umbilical pit. Length about 1 86 inches; breadth 1·32 inches; apical angle convex, divergence 65°.

The most remarkable features about this fine *Paludina*, are is large size, and the peculiarity of having the lower volutions smoothly rounded, or more or less convex, while those nearest the apex are flattened and ornamented by two obscure revolving ridges. The angle on the lower part of the last whorl is very obscure near the aperture, but becomes more distinct higher up, and must be quite conspicuous on young shells. Unfortunately we have no specimens with the aperture entire. Our best specimen consists of four volutions, and. judging from the appearance of the broken apex, it must have had about two more.

We name this species after Prof. Joseph Leidy, of the University of Pennsylvania.

Locality. Ten miles below Fort Union.

VALVATA PARVULA.

Shell very small, much depressed or subdiscoidal; spire rising little above the body whorl; volutions about three, nearly cylindrical, and having near the middle, on the upper and lower sides, a distinct linear carina; surface marked with strong regular lines of growth; sutures distinct; umbilicus wide and deep, showing all the volutions to the apex, aperture round or transversely oval. Height .05 inch; breadth .10 inch.

From *V. tricarinata* (Say,) some varieties of which this resembles more than any species known to us, it differs in having a wider umbilicus, less elevated spire, and much stronger lines of growth.

Locality.—Three miles below Fort Union.

MELANIA MINUTULA.

Shell minute, elongate conical; volutions seven to seven and a half, convex, increasing gradually from the apex and flattened obliquely outward from above, near two-thirds of the way down, whence they round abruptly in to the suture below, so as to form an obscure angle below the middle; suture very distinct; surface faintly marked with fine lines of growth; aperture ovate or sub-rhomboidal, angular above, widest near the middle, very narrowly rounded and obscurely sinuate on the inner side below; columella somewhat less arcuate than the outer side of the aperture; lip thin and slightly reflexed at its junction with the lower part of the columella. Length ·16 inch; breadth ·05 inch; length of aperture ·04 inch, breadth do. ·03 inch; apical angle regular, divergence 20° to 23°.

This beautiful little *Melania* approaches very near in size as well as in form, *M. spina*, a Miocene species described by M. Grataloup (*Conch. Melan.* 10, *t.* 5, *fig.* 6 *and* 7,) but differs in having fewer and more convex volutions.

Locality. Three miles below Fort Union.

MELANIA ANTHONYI.

Shell very small, conical-ovate; spire not much elevated; volutions five to five and a half, slightly convex, increasing somewhat rapidly from the apex, last one rather large and obtusely angular below; surface marked with fine, indistinct lines of growth, crossed by extremely fine, nearly obsolete, revolving striæ; suture well defined; aperture ovate, angular above, widest a little below the middle, narrowly rounded and very faintly sinuate on the inner side below; lip thin, slightly reflexed on the lower and inner side, but leaving open a small umbilical perforation; columella regularly arcuate. Length ·18 inch; breadth ·10 inch; length of aperture ·06 inch; breadth of do. ·04 inch; apical angle slightly convex, divergence 41°.

Without a very careful examination with a good lens, in a favorable light, the extremely fine revolving striæ on this neat little shell would be overlooked. In form it is almost an exact miniature of *M. Nebrascensis* of this paper, but a careful comparison with the young of that species of its own size, shows it to be quite different. In addition to this, it occurs in great abundance at localities where no authentic specimens of that species were met with. We have no doubt of its being an adult shell. We name it after Mr. John G. Anthony, of Cincinnati, Ohio, to whom we are under obligations for suggestions in regard to it and two or three other species described in this paper.

Locality. Yellow stone river, thirty miles above the mouth.

MELANIA MULTISTRIATA.

Shell small, elongate-ovate; spire conical, somewhat elevated, acute at the apex; volutions five and a half to six, convex; surface marked with fine indistinct lines of growth, and exceedingly fine, closely arranged revolving striæ; suture well defined; aperture narrow-oval, or ovate, contracted, but scarcely sinuous below; columella regularly curved. Length ·23 inch; breadth ·12 inch; length of aperture ·10 inch; breadth of do. ·06 inch; apical angle regular, divergence 39°.

This may be distinguished from the last by its more elevated spire, and more elongated body whorl, which is never angular below. The aperture is also narrower, and the columella imperforate. From the young of *M. Nebrascensis* of its own size, it differs in being more elongated, and in having one or two more whorls. The revolving striæ are also more uniform, and so very fine as to be only visible by the aid of a strong magnifier.

Locality. Ten miles above Fort Union.

MELANIA NEBRASCENSIS.

Shell elongate-ovate; spire conical, not very much elevated, acute at the apex; volutions about six, flattened convex; surface marked by fine lines of growth, crossed by numerous more or less elevated revolving lines, some of which, on the middle of the whorls, are sometimes so much larger than the others as to form distinct carinæ; suture strongly impressed; aperture ovate, angular above, narrowly rounded and very faintly sinuous below; outer lip prominent below the middle; columella regularly curved. Length ·78 inch; breadth ·42 inch; length of aperture ·37 inch; breadth of do. ·21 inch; apical angle convex or nearly regular, divergence (variable) 44°.

This species presents numerous varieties of form, apparently dependent upon age. In younger individuals the spire is relatively less elevated, the whorls more rounded and the aperture larger and more oblique. In its surface markings it also varies greatly, even in specimens of the same size. The carinæ formed by the larger revolving lines being in some specimens quite distinct, while in others they are scarcely larger than the finer revolving lines which may be seen by the aid of a lens to form, with the lines of growth, a delicate sub-cancellate surface on all parts of the shell. On other specimens, all these surface markings are almost entirely wanting.

Locality. Ten miles above Fort Union.

MELANIA CONVEXA.

Shell rather large, much elongated, sub-cylindrical or terete; volutions (about ten?) flat, closely wound, and increasing very gradually from the apex; surface ornamented by fine lines of growth, crossed by distinct, regular, thread-like, revolving lines, and extremely fine, nearly obsolete revolving striæ; suture generally indistinct; aperture apparently ovate; lip thin, having a broad very shallow sinus below the suture, and another near the base of the columella. Length about 1·60 inches; breadth ·48 inch; length of aperture ·45 inch; apical angle convex, divergence 21°.

Our best specimen of this interesting species consists of seven volutions, and appears to have lost two or three others from the apex; the aperture is also distorted. The larger revolving lines, about seven of which may be counted on the second volution, are quite distinct, and near one-third as wide as the spaces between, while the finer revolving striæ are closely crowded, and so small as to be only seen by the aid of a good lens. The divergence of the apical angle, below the middle of an adult shell, is not more than 13°, while above, (and in young shells,) it is as much as 28° to 30°.

In the last number of the Proceedings of the Academy, we described a shell resembling this very closely in form, from the Yellow Stone river, where it was found associated, in a loose mass, with fragments of an *Ostrea* and a small Cretaceous species of *Cardium*, (*C. rarum*, Evans and Shumard). Our specimens being worn and imperfect, we supposed, from its associates, it must be a marine shell, and referred it to the genus *Turritella*, under the name of *T. convexa*. We now think it may possibly be a specimen of this species, from the junction of the Cretaceous and Tertiary beds.

Locality. Bad Lands of the Judith.

CERITHIUM NEBRASCENSIS.

Shell elongate-conical, very slender, whorls (nine?) convex, and ornamented by three revolving rows of sharply elevated granules, placed upon obscure vertical folds; surface marked with very fine lines of growth, crossed by much stronger, elevated, thread-like, revolving lines, two, three, or more of which may be counted between each row of granules; suture distinct; aperture apparently nearly circular, but terminating below on the inner side, in a small notch. Length about 1 inch; breadth ·29 inch; apical angle regular, divergence 19°.

On the lower part of the body whorl there are three or four small revolving lines, two of the upper of which are sometimes granular, making on this whorl five rows of granules. Between these and the next row above, one of the revolving lines is also minutely granular. In form and general appearance, this resembles two or three species described by Deshays, from the Paris basin, but on close comparison, we find it quite distinct from them all. Amongst existing species, it appears to be nearest *C. granulosum*, and estuary species from the Western coast of Africa.

Locality. Near head waters of Little Missouri.

We are under obligations to Prof. James Hall, of Albany, New York, for the free use of his extensive collection of books on Palæontology, as well as for occasional sugestions while investigating the Nebraska fossils, described in this and our former papers.

Correction.

In a paper communicated by us to the Academy in March last, and published in the preceding number of the Proceedings, we referred to the genus *Pyrula* a shell (*P. Bairdi*, page 66), which we have since satisfied ourselves belongs more correctly to the genus *Busycon* of Bolten; we now change the name to *Busycon Bairdi.*

Ceratites Americanus.

By PROFESSOR L. HARPER, University of Mississippi.

The Ceratites, a Cephalopodus mollusk, subgenus of Ammonites, has been discovered in Europe long ago. All the European species, without any exception, belong to the new red sandstone or Triassic formation. Twenty-one species have, according to Bronn, been placed in the St. Cassian formation in Tyrol, to which the lowest place in the Trias has most probably to be assigned. One species is found in the St. Cassian rocks and also in the Muschelkalk; one in the Bunter sandstein and the Muschelkalk, and of the remaining eight species, three belong certainly and five probably to the Muschelkalk of the Trias. The Ceratites were therefore considered as characteristic, and belonging exclusively to the new red sandstone formation, and exclusively a European fossil, until a few years ago L. V. Buch, the late great German Geologist, discovered a Ceratites in the cretaceous rocks of the Caucassus, which he called *Ceratites Syriacus.* No species of the Ceratites has heretofore been found on the continent of America.

About three years ago, in summer, 1853, when I was in the State of Alabama, I examined the bed of the Tuscaloosa or Black Warrior River, near the little village of Erie in Greene County, about 12 miles above the confluence of the Tombigbee and Black Warrior rivers, between the 32d and 33d degrees of north latitude, where the river cuts through the lowest part of the cretaceous formation of our southern States, corresponding most probably to the Turonien of D'Orbigny. The bluff of the river consists here entirely of different strata of green sand, divided in several parts by thin seams of a hard conglomerate of peroxide of iron and green sand, and is from 50 to 95 feet high. The river was then unusually low, and more than one-half of its bed perfectly dry and accessible.

On a sand-bank in the middle of the river, immediately below a very deep place, were found, among other evidently cretaceous fossils, three specimens of a small Ammonite, which, after a careful examination, I immediately recognized to be a species of Ceratites, in which opinion I was later confirmed by as high an authority as Prof. L. Agassiz, of Cambridge, who pronounced it to be a new species of Ceratites, closely allied to Ceraticus Syriacus of L. V. Buch.

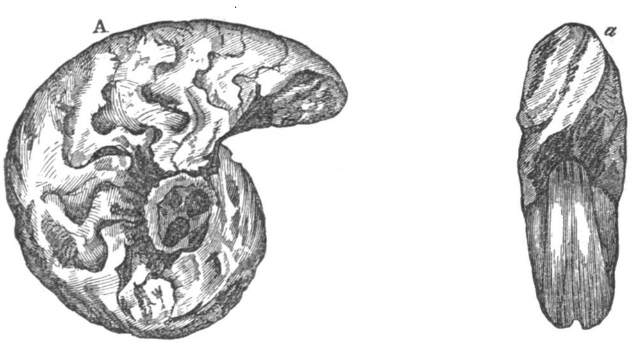
This being the first Ceratites ever found on the continent of America, I propose for it the name of

CERATITES AMERICANUS.

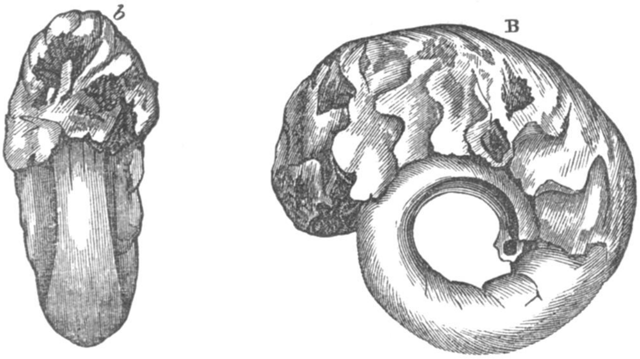
Testa compressa, disco haud dissimili, paulisper densata ad aperturam, valdeque attenuata ad apicem, et præcipue subito accrescente a medio usque ad aperturam; aufractibus duabus, secundo amplecto primi ventre et tanquam in striam posito; apertura semi-ovata; loborum numero, in vita, sex, totidemque sellæ, lobo ventrali attamen nonnihil indistincto; lobis dentibus tribus munitis, qui magnitudinis causa etiam lobi secundarei vocarentur; septis angularibus dorso retrorsum flexis; siphunculo dorsali.

The two specimens, still in my possession and here represented, are both very much water-worn. They are both flat and discoid, No. 2 more so than No. 1; both taper very much towards the apex, and increase especially rapidly from the middle towards the aperture. Both consist of at most two whorls, the dorsal part of the second being more than half overlapped by the ventral part of the first, and lying, as it were, in a groove. They have apparently six lobes and as many saddles, the lobes being provided with three teeth, which, on account of their size, might rather be called secondary lobes. The septa are angular and bent backwards on the back. The siphuncle is dorsal, as seen on fig. A, where it is broken out and has left a groove. In No. 1 the latter half of the second whorl is broken out and a hole is left. The size of both specimens is very nearly the same. No. 1 measures in length 58·3 millimetres, in width 50· s., and in thickness 31. No. 2 measures in length 51· s. millimitres, in width 46, and in thickness 26.

No. 2.



No. 1.



I was first inclined to recognize in the three specimens two different species, but the somewhat different appearance seems to have been caused by the attrition which they have undergone.

The question arises here, from which formation these Ceratites come? The circumstances that they have been found in the lower cretaceous formation, that carbonate of lime is the fossillizer, and that they are closely allied to Ceratites Syriacus of the cretaceous formation of Asia Minor, are indeed strong reasons to pronounce them to be cretaceous fossils, but this seems to me still somewhat doubtful.

When I first saw them, I was not aware that Ceratites had ever been found in any other but in the Triassic formation, and the discovery astonished me in a high degree. I was indeed induced to believe that they indicated the presence of the Trias somewhere not very far from the place where they were found, until I saw that L. V. Buch found Ceratites in the cretaceous rocks.

It is true the specimens alluded to were found on a sand-bank in the Black Warrior River, where it cuts through the lowest part of the cretaceous formation of our southern States, just below a very deep place of the river; but are they not marked out of a formation underlying the upper secondary and reached by the water of the river in that deep place? If these Ceratites were a fossil belonging to the cretaceous formation, even to the very lowest part of it, specimens of them must and would have been found before and after my finding them. There are a great many places in Alabama, as well as in Mississippi and Tennessee, where the lower part of the cretaceous rocks crops out, where it is cut through by rivers and gullies, and where it has often and carefully been examined and searched for fossils, but never, neither before nor afterwards, have specimens of Ceratites been found.

I have myself carefully examined a good many such outcrops in Alabama, even the one where the Ceratites were found; as State Geologist of Mississippi, and for more than two years engaged in the geological survey of this State, I have examined very nearly all the outcrops of the lower cretaceous formation, which is here still better developed than in Alabama; I have made it a particular point to search carefully for Ceratites, but never again have I succeeded to find another specimen of the Ceratites; nor have I ever heard that any one of the many amateurs that collect fossils has ever seen or found one.

That the above described specimens of Ceratites have been washed out of a formation underlying the cretaceous rocks in Alabama, seems to me the more probable, first, as there is in that State between the carboniferous and cretaceous formation an area occupied by an intermediate, undetermined formation, extending from Autuga County through parts of Bibb, Tuscaloosa and Pickens to Fayette County, which has been laid down in the geological chart of that State of 1849 (by a typographical error, as I understand,) as *tertiary*, but which, although in many places covered by drifted tertiary sands and clay, is by no means tertiary. It goes under the lower cretaceous rocks and is overlapped by them, is clearly visible, not only in the northern part of the town of Eutaw, but also at Finch's Ferry, on the Black Warrior, in Greene County. What formation this is seems difficult to decide, it being devoid of fossils. It must, of course, be one of the older formations, intermediate between the coal and the lime, and I should not at all be astonished if a careful examination should give the result of its classification among the Poikilitic rocks, to which its variegated clay bears indeed great resemblance. Another reason which renders it more probable that the Ceratites have been worked out of a formation underlying the cretaceous formation, is that nearly all the Artesian wells in Greene County, in Alabama, contain a great deal of chloride of sodium and give really salt water. It is not very probable that this chloride of sodium, very seldom, if ever, comes from the salt-bearing cretaceous formation.

Examination of the Meteoric Iron from Xiquipilco, Mexico.

By W. J. TAYLOR.

The meteoric iron from Xiquipilco, Mexico, appears to have been first mentioned in the Gazeta de Mexico in 1784. It is stated there that small pieces of native iron, from a few ounces to fifty pounds in weight, were very numerous, which were sought for by the Indians after heavy rains, who used them for manufacturing agricultural implements.

In a dissertation on metallic meteorites by Prof. W. S. Clark, the following notices of its literature are given: Ann. des Mines t. 2, ser. 1, p. 337. Gazeta de Mexico 1784—85, vol. i., pp. 146, 200. Klaproth Beiträge zur chemischen

Kenntniss der Mineral Körper, B. 4, S. 101. Sonnenschmit, Beschriebungder vorzüglichsten Bergsrerke. Reviere in Mexicò 1804, S. 192 and 288. Chaldni, (U. F. M. S. 336.) Partsch, (D. M. S. 99.)

In the examination made by M. Berthein he failed to detect the presence of cobalt, but it is mentioned by Prof. Clark that Manross had found it in a specimen from the cabinet of Prof. Wöhler; my examination confirms in this respect that of M. Manross.

To the kindness of W. S. Vaux, Esq., I am indebted for the material for this investigation; Mr. Vaux has in his magnificent cabinet the principal portion of a mass which weighed over ten pounds. It was originally about six inches long, with an average diameter of three inches; the lump was oblong with rounded ends, the whole being covered with a thin crust of limonite.

A cross section cut from this lump has been carefully polished and etched by strong nitric acid, which gives a most beautiful surface of about three and a half inches in length by two and a half in breadth, covered with the greatest complexity of widmannstellian figures which almost defy description.

The surface is crossed by bands about one-tenth to one-sixteenth of an inch in breadth; these apparent bands are cross sections of different planes, as is readily perceived by their different refractive powers.

On changing the position of the specimen, those that are a bright silvery-white in one direction, become a dull gray in another, and vice versa.

There are several systems of bands, which preserve a parallelism among themselves and cross other systems at various angles, forming trapezoids, rhombs and triangles. These several fields and their characteristic etchings will be described in detail at some future time. Along the bands or planes thin laminæ of schreibersite have been observed, as in other meteoric irons.

Imbedded in one side of the large lump (just described) was a globule of pyrrhotine, which looks as if it had been dropped into the iron when it was in a semi-fluid state. This globule appears to have been about an inch in diameter; it was in part decomposed, but a small portion of the mineral was separated sufficiently pure for the determination of its specific gravity and analyses. On dissolving it in hydrochloric acid, thin laminæ of schreibersite separated with minute portions of chromic iron.

Through the kindness of Dr. F. A. Genth, I have been permitted to make the following analyses in his laboratory:

Pyrrhotine dissolved in nitric acid, gave

Sulphur,	33·76	per cent.
Iron,	57·95	"
Nickel,	6·70	"
Cobalt,	·56	"
Silicon,	·05	"
Phosphorus,	·25	"
	99·27	"

No. 2. Dissolved in hydrochloric acid, gave—

Iron, - - - - - - - 58·25 per cent.

A residue remained, which was dissolved after being treated with hydrochloric acid and chlorate of potash; it consisted of—

Copper, - - - - - - - 0·12 per cent.

The remainder consisted principally of chromic iron, with a small portion of schreibersite.

The specific gravity was found to be 4·822. The ratio of sulphur to the metals was found to be

$$\text{Sulphur, } 2{\cdot}102 \qquad \left.\begin{matrix}\text{Iron, } 2{\cdot}066\\ \text{Nickel and Cobalt, } 0{\cdot}245\end{matrix}\right\} 2{\cdot}301$$

It will be seen that the composition corresponds with that of pyrrhotine, considering its formula to be FeS, if we disregard the few impurities which were found with it.

The meteoric iron was first treated in a flask with hydrochloric acid, and the gas evolved was passed through a solution of ammonia chloride of copper, but not a trace of sulphur could be detected in this manner.

In the 5th supplement to Rammelsberg's Handwörterbuch der Chemischen Mineralogie, this meteoric iron is mentioned as passive, experiments having been made by Prof. Wöhler; but the piece belonging to Mr Vaux is evidently active, throwing down metallic copper from a neutral solution of its sulphate. This experiment was repeated with great care with confirmatory results.

No. 1 was dissolved in hydrochloric acid, and a slight precipitate was obtained by hydrosulphuric acid, which, on a careful examination before the blow-pipe, was found to be copper with a trace of tin.

Iron, - - - - - - -	90·72	per cent.
Nickel, - - - - - - - -	8·49	“
Cobalt, - - - - - - -	·44	“
Schreibersite, chromic iron, &c., - -	·38	“
Silicon, - - - - - - -	·25	“
Phosphorus, - - - - - -	·18	“

The phosphorus was estimated in a separate portion, which was first oxydized by nitric acid and fused in a platinum crucible with carbonate of soda.

No. 2 was dissolved in nitric acid. It gave—

Iron, - - - - - - -	90·37	per cent.
Nickel, - - - - - - - -	7·79	“
Insoluble residue, - - - -	1·91	“

Description of two new species of Urodeles, from Georgia.

By EDWARD HALLOWELL, M.D.

Sub-Fam. BOLITOGLOSSIDÆ.

PSEUDOTRITON MARGINATUS, nob.

Char. Head small, depressed, rounded in front; eyes lateral, oblique, not prominent, looking upward and outward; gape of the mouth extending a short distance behind the posterior commissure of the eye; maxillary teeth small, internal nares small and circular; a transverse row of vomerine teeth on each side passing behind the internal nares, continuous with several rows of longitudinal palatine teeth diverging posteriorly, so as to leave a wide interspace in the shape of the letter V reversed; tongue small, circular, bolitoglossal, free at the edges, and supported upon a small central pedicel; body slender, cylindrical; extremities slender; toes 4—5; tail somewhat compressed, longer than body.

Color. Dark ash color above, almost black, shaded obscurely with yellow; a lateral band of dusky white margined with black on each side near the abdomen, extending from the anterior to the posterior extremities; under parts dusky white, very minutely spotted or blotched with black.

Dimensions. Length of head 3 lines; greatest breadth 2 lines; length of neck and body to vent 1 inch 4 lines, (Fr. ;) length of tail 1 inch 4 lines. Total length 2 inches 11 lines.

Habitat. Liberty County, Georgia. One specimen in Mus. Acad. Nat. Sc., presented by Major Le Conte.

PSEUDOTRITON FLAVISSIMUS, nob.

Char. Head of moderate size, rounded above; snout truncate; eyes rather prominent, latero-superior, oblique, looking upward and outward; tongue small, circular, mushroom-shaped, supported upon a central pedicel, the edges free; internal nares rather small, ovoid or subcircular in shape; maxillary teeth minute, sharp-pointed, the points directed backward; vomerine and palatine teeth as in marginatus; body more robust than in the former species, more or less compressed upon the sides; extremities slender; tail compressed, of nearly same length as body, (about a line longer.)

Color. Yellow above, inclining to brown, with very numerous small black spots; under parts of a brighter yellow throughout, without spots.

Dimensions. Length of head 4 lines; greatest breadth 3 lines; length of neck and body 1 inch 2½ lines, (Fr.;) of tail 1 inch 5 lines; total length 3 inches 2 lines.

Habitat. With the preceding in Georgia. One specimen in Mus. Acad. Nat. Sc., presented by Major Le Conte, U. S. A.

Contributions to the Ichthyology of the Western Coast of the United States, from specimens in the museum of the Smithsonian Institution.

By Charles Girard, M. D.

Two years have scarcely elapsed since I communicated to the Academy descriptions of various fishes collected upon different points of the Pacific coast of North America. During that period the indefatigable researches of several officers of the U. S. Army, and naturalists attached to the surveys made under orders from the General Government, have brought to light many new and interesting members of that class of animals, and of which I propose now to give a brief account, extracted from final Reports, made to the officers in charge of these surveys.

It has also been deemed advisable to mention such changes as have been made in the generic position of several species previously described, either by me or others, in order to give a more correct idea of the Reports just alluded to.

It will be remembered that while I was engaged in those investigations of our Western fishes, two naturalists, Drs. W. O. Ayers and W. P. Gibbons, both residents of San Francisco, Cal., had (without any knowledge of what I was doing,) described a certain number of species, some of which we already know have proved identical with my own. The law of priority in their publication will decide upon the names to be finally adopted in the nomenclature. So far I have been unwilling to settle upon any identifications without the specimens to go by, in order to avoid confusion as well as complicate the synonymy. Drs. Ayres and Gibbons, both, have shown an earnest desire to furnish me with authentic specimens of the species which they have described, and I am happy to say that from the former I have been favored by a good many up to this day, as will be seen further on.

For reference to the species described by Prof. Agassiz, some of which have appeared in my papers, it is but just to say that such identifications as were attempted by me, were made from the accounts published at that time. As far as genera are concerned I feel confident that no error was committed; in regard to the species I entertain certain doubts which can not be removed by the documents at our command. I have sought to do justice to the subject from the very beginning, and rather than introduce any changes in their present nomenclature I send them before the world as they now stand.

With the above preliminaries I proceed into the subject.

The species formerly described by me under the genus *Labrax* were found, upon further examination, to constitute a genus by itself, the relationship of which being more those of *Serranus* than of *Labrax*, and it is in the vicinity of the former that it ought to be placed in the ichthyic method. From *Serranus* it may be distinguished by the outline of the spinous dorsal fin, and the relative development of the canine teeth, which are so small as to have suggested the idea that the species belonged to *Labrax*.

The new genus we will henceforth call

PARALABRAX,

and characterise as follow: "General physiognomy that of *Labrax*, but the first dorsal fin is contiguous to the second as in *Serranus*. The profil of the body is subfusiform the caudal fin subtruncated or slightly emarginated posteriorly.

The head is subconical, the lower jaw a little longer than the upper, the mouth rather large; card-like teeth upon the premaxillaries, dentaries, vomer and palatines, with a row of small canine teeth along the edges of the jaws. Tongue smooth. Small and homogenous spines upon the outer curve of the preopercle. Two small and inconspicuous spines upon the margin of the opercle. Edge of suborbital, entire; humerus denticulated; opercular apparatus and cheeks covered with scales, smaller on the cheeks than on the opercles. Gill openings continuous under the throat; branchiostegal rays, six in number. Scales minutely serrated posteriorly."

PARALABRAX NEBULIFER and P. CLATHRATUS

are the two species.

Dr. Ayres's *Centrarchus maculosus* is my C. INTERRUPTUS.

A new and interesting member of the group *Trachinidæ*, we inscribe into the method under the appellation of

HOMALOPOMUS,

" The general aspect of which is elongated, the mouth large, the lower jaw longest; upper and lower jaws provided with canine teeth; card-like teeth on the vomer. Palatines toothless; tongue smooth. Dorsal fins separated; anterior, small and subtriangular; posterior, extending mostly to rest of space towards the caudal. Anal fin longer than deep, situated far back. Opercular apparatus spineless and scaly; cheeks smooth and scaleless. Upper surface of head covered with minute scales. Scales covering the body of moderate development with posterior margin entire, and smooth. Gill openings continuous under the head; branchiostegals, six in number."

A single species is known, several specimens of which were examined, all of which were collected at Astoria, Oregon Territory, by Lt. W. P. Trowbridge, U. S. A., to whom I take pleasure in dedicating it.

HOMALOPOMUS TROWBRIDGII

has the "snout pointed, the mouth deeply cleft, and the posterior extremity of the maxillaries extending to the vertical line of the posterior edge of the pupil. The eyes are large. The tips of the pectoral fins reach as far as the anterior margin of the anal fin. The color is greyish brown above, and silvery grey beneath."

In the Cottoid group there are glorious additions. In the first place I have had the great satisfaction of identifying, from actual specimens, the *Cottus asper* of Sir John Richardson, and to describe it comparatively with the other members of the same genus.

Amongst the truly marine representatives I will first introduce a type which seems to bear much closer affinities to the fresh water genera than was anticipated.

In naming it

OLIGOCOTTUS,

allusion is made chiefly to its diminutive size. We have full evidence that the specimens before us are adults, and consequently have not hesitated in the selection of that name. We are aware, however, that further search might bring to notice other species not quite so small and still of the same generic stamp. On the other hand, the etymology of a name is of but little avail towards elucidating the history of the object it designates. The natural characters of the genus will read as follows: "Head smooth, with the exception of a few spines upon the preopercle and snout. Upper jaw slightly the longest. Teeth upon the premaxillaries, dentaries, front of vomer and palatines. Gill openings continuous under the throat; branchiostegals six. Dorsal fins contiguous. Caudal posteriorly rounded. Insertion of ventrals backwards the base of pectorals. Origin of anal fin in advance of the anterior margin of second dorsal. Skin smooth, lateral line continuous for the whole length of the body."

OLIGOCOTTUS MACULOSUS.

being the only species known at present, we will characterize it by saying: "that the mouth is moderately cleft; the posterior extremity of the maxillary extending to a vertical line intersecting the pupil. A stoutish bicuspid processus on the convexity of the preopercle. Two acute nasal spines. Anterior dorsal lower than the second or posterior. Yellowish brown above, mottled or variegated with blackish; along the dorsal region a series of blotches of a deeper hue; lower half of the sides vermiculated. Abdomen of a bright saffron or yellow hue in the male. Inferior surface of head with traces of black markings; throat and abdomen unicolor, as also the ventrals and anal. Dorsals, caudal, and pectorals transversally barred."

It has been observed on several points of the coast between the bay of San Francisco, Cal., to Puget Sound, W. T. In 1854, a few dried up specimens were taken near Presidio by Lt. W. P. Trowbridge, but their precarious state of keeping did not permit us to classify them. The same was the case with those collected at Fort Steilacoom by Dr. Geo. Suckley. It is but very recently that well preserved specimens, collected by E. Samuels, in Tomales Bay, Cal., having reached us, we have been prepared to determine their position in the ichthyic method.

The fish mentioned by Dr. Ayres under the name of *Acanthocottus inermis* proves to be my LEPTOCOTTUS ARMATUS.

Next in order is another and entirely new genus, for which the name of

LEIOCOTTUS,

has been selected, more particularly in reference to its smooth aspect. Its characters are: "head perfectly smooth; spines upon the preopercle only. Mouth moderately cleft: jaws equal. Teeth upon the premaxillaries, dentaries and front of the vomer; none on the palatines. Barbules upon the maxillaries. Gill openings continuous under the throat; branchiostegal rays five. Dorsals nearly contiguous upon their bases. Ventrals inserted backwards of the base of the pectorals. Caudal posteriorly subtruncated. Skin perfectly smooth, bearing neither prickles nor scales. Lateral line well marked and continuous from head to tail."

The species which has come under my observation has so much of the aspect of *Trigla* that the specific name of

LEIOCOTTUS HIRUNDO

suggested itself for it." The snout is declivous and rather pointed; the posterior extremity of the maxillary is provided with two or three barbules and reaches a vertical line drawn a little beyond the anterior rim of the orbit. Superior regions blackish brown; abdomen whitish beneath; inferior part of tail yellow."

It was collected by Lt. W. P. Trowbridge, U. S. A. at the island of San Miguel, Cal.

Dr. Ayres' *Hemitripterus marmoratus*, is my SCORPÆNICHTHYS MARMORATUS,

Clypeocottus robustus of the same author, is my ASPICOTTUS BISON.

The species described by me as *Scorpænichthys lateralis* was subsequently referred by Dr. Ayres to a new genus of his under the denomination of *Calycilepidotus lateralis*, together with another species at that time unknown to me, under the name of *C. spinosus*. On a former occasion Dr. Ayres had announced the presence of two species of hemilepidoti in the Bay of San Francisco, for which he proposed the names of *H. nebulosus* and *H. spinosus*. My *Scorpænichthys lateralis* was subsequently identified by himself to his *H. nebulosus*, and it was then that the genus *Calycilepidotus* appeared with two species: *C. spinosus* and C. *lateralis*.

C. spinosus I have carefully examined, and I am satisfied that its proper place is in the genus *Hemilepidotus*, as characterised by Cuvier. In order, however, to furnish reliable data to go upon, I must be permitted to offer a diagnosis of of that genus as it now stands.

HEMILEPIDOTUS.

"Head rough and prickly, with membranous flaps on various parts; opercular apparatus spinous. Mouth moderately cleft; jaws equal. Teeth upon the premaxillaries, dentaries, front of vomer and palatines. Gill openings separated beneath by an isthmus; branchiostegals, six on either side. Dorsal fins contiguous. Caudal rounded posteriorly. Insertion of ventrals opposite the base of pectorals. Longitudinal bands of scales alternating with nacked areas; scales themselves finely denticulated."

HEMILEPIDOTUS SPINOSUS

"has membranous flaps on the upper surface and sides of the head. The eyes are quite large. The posterior free extremity of the maxillary extends to a vertical line drawn at the posterior rim of the pupil. Dorsal band of scales composed of six rows or series; lateral band of seven, five below and two above the lateral line. Ground color dark reddish brown, with darker transverse bands and blotches."

Specimens labelled by Dr. Ayres were collected in the Bay of San Francisco, Cal., by Dr. John S. Newberry; others in Humboldt Bay, by Lt. W. P. Trowbridge, U. S. A.

So much for *Calycilepidotus spinosus*: it is a true Hemilepidotus.

As to *C. lateralis*, the second species of Dr. Ayres' genus, a careful study has convinced me that it is not specifically identical with my *Scorpænichthys lateralis*. Subsequent investigations of more perfect specimens have convinced me of the propriety of removing the latter from the genus Scorpænichthys, and since I had no specimens of *Hemilepidotus nebulosus*, Ayres, (*Calycilepidotus lateralis*, Ayres, non mihi) by which to determine its generic affinities, I have been compelled to institute, under the name of

ARTEDIUS,

a new genus to receive two species, the one above referred to, and formerly described by me as *Scorpænichthys lateralis*, and another which so far had remained unnoticed. The following are its characters: "Head rough, with supra-orbital membranous flaps. Spines upon the preopercle only. Mouth moderately cleft; lower jaw slightly overlapped by the upper. Teeth upon the premaxillaries, dentaries, front of vomer, and palatines. Gill openings continuous under the throat; branchiostegals five on either side. Dorsal fins separated. Caudal subtruncated posteriorly. Insertion of ventrals opposite the base of the pectorals. A dorsal band of pectinated scales."

ARTEDIUS LATERALIS.

Scorpænichthys lateralis, Grd., has the "surface of the head smooth. Preopercle armed with a flat bicuspid spine. Band of dorsal scales narrow, originating at the thoracic arch and extending to near the terminus of the base of the second dorsal. Anterior margin of first dorsal situated in advance of the thoracic arch. Deep chesnut brown above, maculated with yellowish; beneath yellowish."

Specimens collected at San Luis Obispo, Cal., by Lt. W. P. Trowbridge, U. S. A.

ARTEDIUS NOTOSPILOTUS

is characterised by the "surface of the head being subtuberculous and scaly. Preopercle armed with a flat tricuspid spine. Anterior margin of first dorsal situated in advance of the beginning of the dorsal band of scales, which is broad and extends from the thoracic arch to near the terminus of the base of the second dorsal. Olivaceous, with a series of saddle-like black patches. Abdomen dull yellow or white."

Collected by E. Samuels in Tomales Bay, Cal.

Sebastes ruber, Ayres, is my SEBASTES ROSACEUS.

Sebastes nebulosus, Ayres, is my SEBASTES FASCIATUS.

Sebastes variabilis, Ayres (not Cuvier) is my SEBASTES AURICULATUS.

Sebastes melanops,

is a species hitherto undescribed, and which we thus characterise: "Upper surface of head generally spineless. Posterior extremity of maxillary reaching a vertical line drawn interiorly to the posterior rim of the orbit. Origin of dorsal fin opposite or else slightly in advance of the base of the pectorals. Upper regions blackish brown; sides brownish, spotted with black; beneath greyish brown."

Specimens were collected at Cape Flattery, W. T., and at Astoria, O. T., by Lt. W. P. Trowbridge, U. S. A.

A fine addition to the group of Heterolepids instituted in 1854 with two genera. *Chirus* and *Ophiodon*, is the new genus

OPLOPOMA,

characterised by an "elongated body, membranous flaps above the orbits, and spines on the preopercle. The snout is conical; the mouth large, and the lower jaw the longest. Canine teeth upon the premaxillaries, dentaries, front of vomer and the palatines. Gill openings continuous; branchiostegals six on either side. Dorsal fins contiguous. Caudal posteriorly subcrescentic or else concave. Insertion of ventrals a little posterior to the pectorals. Body covered by small cycloid scales."

Oplopoma pantherina,

the only species hitherto known, has the "upper surface and sides of the head granular. The preopercular spines are few, small and blunt. Posterior extremity of maxillary extending beyond the orbit. Origin of anterior dorsal situated in advance of the convexity of the preopercle. Scales extending over the base of both the caudal and pectoral fins. Blackish brown above, reddish brown beneath. Dorsal and lateral regions spotted with black."

Specimens of this species were collected by Lt. W. P. Trowbridge, at Cape Flattery, W. T.

Gasterosteus serratus, Ayres, I have investigated carefully, and found specifically distinct from its congeners.

I describe another species akin to it and *G. plebeius.*

Gasterosteus intermedius

having the "body plated all over; the peduncle of the tail keeled. Dorsal spines three, moderate in development and inconspicuously serrated upon their edges; anterior one inserted immediately behind the base of the pectorals. Insertion of ventrals under the second dorsal spine; their own spine being serrated upon both edges, more conspicuously above than below, and their extremities not extending as far as the tips of the *ossa innominata.* Posterior margin of caudal concave."

Inhabits Cape Flattery, W. T., where it was collected by Lt. W. P. Trowbridge, U. S. A.

Finally, under the name of

Gasterosteus pugetti,

I introduce a new species in which the "body is only plated in part. Dorsal spines three, slender, not serrated upon their edges; anterior inserted immediately behind the base of pectorals. Insertion of ventrals in advance of the second dorsal spine; their own spine being slender, crenated upon its edges and extending beyond the tips of the *ossa innominata.* Posterior margin of caudal slightly emarginated."

Fort Steilacoom, Puget Sound, W. T.; collected by Dr. Geo. Suckley, U. S. A.

Leiostomus lineatus, Ayres, has come within my observation. The species is characteristic. Specimens of it were brought home by Dr. J. S. Newberry.

Leptogunellus gracilis, Ayres, I have likewise examined on specimens collected by Dr. Newberry and labelled by Dr. Ayres.

GOBIUS NEWBERRYI

is a small and very graceful species of Goby, hitherto undescribed. The average size of many specimens observed is about two inches or less, the head forming the fourth of the total length. The first dorsal is contiguous to the second at its base, and is considerably lower than the latter. The mouth is deeply cleft, the posterior extremity of the maxillary extending to a vertical line passing posteriorly to the orbit. The origin of the anal is situated a little behind the anterior margin of the second dorsal: both fins terminate evenly, as far as concerns the tips of the posterior rays. The caudal forms the fifth of the total length. The ground color is olivaceous, but the upper regions appear blackish with isolated spots of the ground color; the inferior regions are unicolor.

Atherina storeri, Ayres, is my ATHERINOPSIS CALIFORNIENSIS.

RHACOCHEILUS TOXOTES, Agass., was identified on a specimen collected by E. Samuels in Tomales Bay.

HYSTEROCARPUS TRASKII, Gibbons, could be recognized on a specimen collected at Fort Reading by Drs. J. F. Hammond and John S. Newberry. Another specimen from the same locality had no irregular transverse bands of black, but was almost *unicolor*.

Another species of viviparous fish,

EMBIOTOCA ARGYROSOMA,

is easily distinguished from its congener by the brilliant argentine tint of its entire body, though made a little darker along the dorsal region by a greyish or pinkish hue. The general form is elongated; the head rather small, subconical, rounded anteriorly, and contained four times and a half in the total length. The caudal is deeply forked. The posterior extremity of the anal extends a little more posteriorly than the dorsal. The tips of the pectorals reach a vertical line passing beyond the origin of the anal. Specimens were collected at San Francisco, Cal., by Lt. W. P. Trowbridge, U. S. A.

OSMERUS ELONGATUS, Ayres, has been collected at San Francisco, Cal., by Dr. John S. Newberry. The specimens were identified by Dr. Ayres.

A most important (I was almost going to say unexpected) discovery of a white fish was made by the party on the R. R. Survey of California and Oregon, commanded by Lt. R. S. Williamson. And since it is different from its hitherto known congener, we will call it

COREGONUS WILLIAMSONI,

as commemorative of that Survey. Its head is rather small, being contained about five times in the total length, which measures eleven inches. The mouth is very small and the posterior extremity of the maxillary does not extend as far back as the anterior rim of the orbit. The scales are large; eighteen rows of them may be counted between the anterior margin of the dorsal and the insertion of the ventrals: nine above the lateral line, and eight below it. The lateral line, itself, is perfectly straight. The caudal fin forked as usual. The pectorals are rather small. I have alluded to the color in saying it was a white fish; add to it a bluish grey hue along the back. It was collected by Dr. Newberry in the Des Chutes river, a tributary of the Columbia.

In adding a second species to the genus Platichthys, the diagnose of this genus must be modified so as to read: "eyes on either the right or left side," for

PLATICHTHYS UMBROSUS,

which is the new species referred to, has its eyes on the right, whilst in the species formerly described, they are on the left. It can also readily be distinguished from its congener in having the body completely covered with scales, on the surface of some of which prickles or asperities are observed. The specimen before us measures seven inches and a half, is of a uniform blackish brown hue on the right side and light brown on the left. It was collected by Lt. W. P. Trowbridge, U. S. A., at Cape Flattery, W. T.

I have likewise a second species to add to my genus Pleuronichthys, taking this opportunity of correcting a *lapsus linguæ* which occurred in the diagnosis of its generic characters: "teeth very inconspicuous, occupying the colorless side of the jaws," instead of both sides of the jaw. That this was a mere accident will appear obvious by reading the characters given to Parophrys, in which an allusion is made to the true state of things in Pleuronichthys.

PLEURONICHTHYS GUTTULATUS,

appears to be a smaller species than its congener; it is also deeper, less elongated, hence more of a subcylindrical general form. The eyes are situated on the right side. The origin of the dorsal fin is not quite even with the anterior margin of the orbit, and in that respect the generic diagnosis will undergo a slight modification. The largest specimens observed measure a little over three inches. The ground color appears greyish black, over which are scattered light spots appearing like as many drops irregularly dispersed. Specimens were collected in Tomales Bay by E. Samuels.

A specimen of *Ophidium*, in a too precarious state of preservation to be determined specifically, was found by Lt. W. P. Trowbridge, at S. Farallones, near San Francisco. Another was collected by Dr. Suckley at Shoalwater Bay, W. T., apparently of the same species.

We have also to mention a Sandlaunee, under the name of

AMMODYTES PERSONATUS,

the general aspect of which is shorter than its congeners, although the form and outline of the body are not materially different. We perceive no teeth on the palat. The posterior extremity of the maxillary extends to a vertical line which intersects the anterior rim of the orbit. The origin of the dorsal fin is situated anteriorly to the tips of the pectorals. The base of the caudal fin is black. Specimens were collected at Cape Flattery, W. T., by Lt. W. P. Trowbridge, U. S. A.

SYNGNATHUS CALIFORNIENSIS, Storer,

was received from Monterey, Cal., through the care of A. S. Taylor. The specimen is somewhat imperfect; it is the largest of those which we have examined from the Pacific coast.

ACCIPENSER ACUTIROSTRIS, Ayres,

was brought home by Dr. Newberry, the specimen having been labelled by Dr. Ayres in San Francisco, where the specimen was procured.

ACIPENSER MEDIROSTRIS, Ayres, was received in the same manner as the preceding.

ACIPENSER TRANSMONTANUS, Rich., from the Columbia river, has been collected by Dr. Suckley.

We conclude by referring to a ray of a remarkable genus,

RHINOPTERA VESPERTILIO,

which was caught in Tomales Bay, by E. Samuels. The specimen before us measures nineteen inches and a half from the extremity of the mouth to the tip of the tail, six inches and three quarters being the length of the body and head together. The width from the tip of one pectoral fin to the other is twelve inches. There is a small dorsal fin situated upon the anterior portion of the tail, followed by a flattened spear shaped spine, serrated upon its edge. The tail is very attenuated, flagelliform, tapering into a filiform extremity. The cephalic region is as long as the rest of the body. Its anterior outline is rounded. The eyes are very prominent and somewhat raised above the surface of the head. The respiratory apertures, five in number are transversally elongated and arranged upon an open curve. The lips are fringed. The color is of an uniform bluish slate above; dull whitish beneath.

Mr. Ord, on behalf of the Committee appointed to procure subscriptions to the Wilson Monument Fund, reported that he had received and transmitted in the name of the President and Members of the Academy, the sum of $280. From persons not members, he had received and transmitted the sum of $35. The report was adopted and the Committee discharged.

Mr. Cassin, on behalf of the Committee appointed to prepare a correct list of the Correspondents of the Academy, reported progress and requested a continuance; which request was granted.

The Corresponding Secretary presented his report for the last month.

ELECTION.

Dr. Charles S. Boker, Mr. John McAllister, Jr., and Dr. Samuel S. Garrigues, all of Philadelphia, were elected *Members.*

Dr. Morris* stated that Alexis St. Martin, on whom Dr. Beaumont performed his celebrated series of experiments, is now in town, and has been submitted to some experiments at the Pennsylvania College by Dr. F. G. Smith, in the presence of a few physicians. On Monday last, after breakfasting on bread and butter and coffee, he partook at 10½, A. M., of beefsteak; at the expiration of two hours the fluid contents of the stomach were withdrawn by means of a catheter. They had a decidedly acid reaction, but whether from chlorohydric or lactic acid, I was unable to ascertain from the small quantity forwarded to me for examination. The meat was rapidly being converted into chyme; small flocculi floated in the fluid and collected at the bottom, much paler than natural. On being subjected to the microscope, the cellular tissue had nearly all disappeared, while the muscular fibres exhibited all stages of disintegration; some were found nearly of the usual color, some paler and with the transverse striæ beautifully marked. As the latter became less evident, longitudinal striation exhibited itself, while a minute punctation took the place of the transverse striæ. As the digestive process advanced, the whole fibril became granular, but the longitudinal striation remained as long as there was any evidence of the structure. This goes to confirm the view of the minute anatomy of the muscles maintained by Kölliker, in opposition to Todd and Bowman's disc theory. The nuclei of the ruptured gastric cells, epithelium from the mouth, esophagus and stomach, with numerous fat granules, completed the microscopic appearances. This morning, at 10½ A. M., he partook of bread, and the fluid being withdrawn as before at the end of two hours, presented the following appearances: The supernatant fluid resembled a starch solution, but on close examination gave the faintest possible evidence of starch by the iodine test, which I am disposed to regard as due mainly to the dextrine present. Trommer's test gave abundant proof of the presence of the latter, or of grape sugar, or both, and also indicated by the purplish hue of the liquid on the addition of sulphate of copper and potassa to the fluid, the presence of a protein body. The remnants of the bread, fully disintegrated, subsided to the bottom, and showed abundant evidence of starch. So far as this experiment goes, it confirms the views generally held as to the action of the saliva upon amylaceous bodies, in contravention to those advanced by Lehmann, as to the active part played by the intestinal fluid (the secretion of the intestinal mucous membrane) in digestion. The greater part of the bread had disappeared, giving place to grape sugar, in consequence of the almost momentary action of the saliva, and leaving mainly the function of absorption to be performed by the intestinal mucous membrane.

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*This communication being mislaid, could not be introduced into its proper place, under date of May 6th.